



2022 GAVeCeLT
Rome, December 5th-6th-7th

La tecnica dell'ECG intracavitario: stato dell'arte e prospettive future

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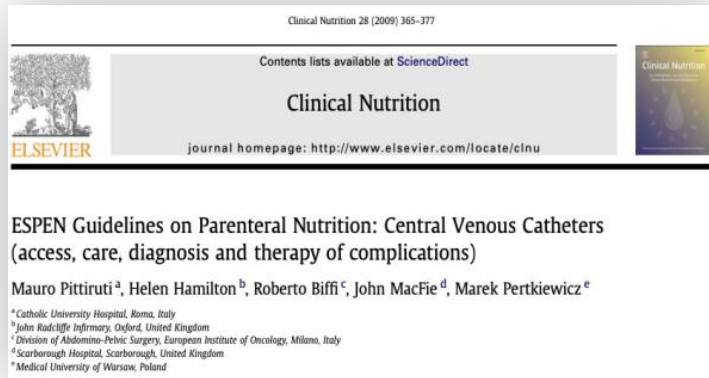
Terapia Intensiva Cardiochirurgica e Cardioanestesia

Gemelli



Fondazione Policlinico Universitario Agostino Gemelli IRCCS
Università Cattolica del Sacro Cuore

Tip location: cosa sappiamo



The tip of a central venous catheter should be positioned in the lower third of the superior vena cava, or at the atrio-caval junction, or in the upper portion of the right atrium (Grade A). Tip

STANDARDS OF PRACTICE

Infusion Therapy Standards of Practice, 8th Edition

Gorski, Lisa A. MS, RN, HHCNS-BC, CRNI®, FAAN; Hadaway, Lynn MEd, RN, NPD-BC, CRNI®; Hagle, Mary E. PhD, RN-BC, FAAN; Broadhurst, Daphne MN, RN, CVAA(C); Clare, Simon MRes, BA, RGN; Kleidon, Tricia MNSc (Nurs. Prac), BNSc, RN; Meyer, Britt M. PhD, RN, CRNI®, VA-BC, NE-BC; Nickel, Barb APRN-CNS, CCRN, CRNI®; Rowley, Stephen MSc, BSc (Hons), RGN, RSCN; Sharpe, Elizabeth DNP, APRN-CNP, NNP-BC, VA-BC, FNAP, FAANP, FAAN; Alexander, Mary MA, RN, CRNI®, CAE, FAAN

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Tip location: cosa sappiamo

Tip location should preferably performed during, rather than after the procedure

Post-procedural control of tip location is associated with the possible need for repositioning the tip. Which implies:

- waste of time
- waste of resources
- potential harm to the patient

2016



Use methods for identifying CVA tip location during the insertion procedure (ie, "real time") due to greater accuracy, more rapid initiation of infusion therapy, and reduced costs.



Contents lists available at ScienceDirect

Clinical Nutrition

Journal homepage: <http://www.elsevier.com/locate/clnu>

ESPEN Guidelines on Parenteral Nutrition: Central Venous Catheters (access, care, diagnosis and therapy of complications)

Mauro Pittiruti^a, Helen Hamilton^b, Roberto Biffi^c, John MacFie^d, Marek Pertkiewicz^e

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High osmolarity PN requires central venous access and should be delivered through a catheter whose tip is in the lower third of the superior vena cava, at the atrio-caval junction, or in the upper portion of the right atrium (Grade A). The position of the tip should preferably be checked during the procedure, especially when an infraclavicular approach to the subclavian vein has been used.

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ORIGINAL ARTICLE

Central venous access devices in pediatric malignancies: a position paper of Italian Association of Pediatric Hematology and Oncology

Alessandro Crocchi¹, Assunta Tornesello², Mauro Pittiruti³, Angelica Barone⁴, Paola M. Angelo Claudio Molinari⁵, Valeria Grillenzoni⁷, Viviana Durante⁶, Maria Pia Cicalese⁸, et al.

- The tip location should be ideally verified in real time during the procedure by intracavitary EKG or by echocardiography or—as a second option—soon after the procedure by chest x-ray or by echocardiography

Tip location con ECG intracavitario

Accurate Central Venous Port-A Catheter Placement: Intravenous Electrocardiography and Surface Landmark Techniques Compared by Using Transesophageal Echocardiography

Koung-Shing Chu, MD*, Jong-Hau Hsu, MD†, Shie-Shan Wang, MD‡, Chao-Shun Tang, PhD§, Kuang-I Cheng, MD§, Chien-Kuo Wang, MD||, and Jiunn-Ren Wu, MD†

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Transesophageal echocardiographic evaluation of ECG-guided central venous catheter placement

[Évaluation échocardiographique transœsophagienne de la mise en place d'un cathéter veineux central guidée par ECG]

Yunseok Jeon MD,* Ho-Geol Ryu MD,* Seung-Zhoo Yoon MD,* Jin-Hee Kim MD,† Jae-Hyon Bahk MD‡

Transesophageal Echocardiography for Verification of the Position of the Electrocardiographically-Placed Central Venous Catheter

Joerg Ender, MD, Gabor Erdoes, MD, Eugen Krohmer, MD, Derk Olthoff, MD, PhD, and Chirojit Mukherjee, MD

Tip location con ECG intracavitario

The Accuracy of Electrocardiogram-Controlled Central Line Placement

Ralf E. Gebhard, MD*

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FFASA‡

Vladimir Melnikov, MD‡

Christianne Vogt, MD‡

Robert D. Warters, MD‡

BACKGROUND: Electrocardiogram (ECG) guidance to confirm accurate positioning of central venous catheters (CVC), placed before surgery in the operating room, is rarely used in the United States. We designed this randomized, controlled trial to investigate whether the use of this technique impacts the accuracy of CVC placement.

METHODS: Patients in group ECG ($n = 147$) had a CVC placed using right-atrial ECG to guide catheter tip positioning. CVCs in group NO-ECG ($n = 143$) were positioned without this technique.

RESULTS: Overall, guidewire-ECG control resulted in more correctly positioned CVCs (96% vs 76%, $P \leq 0.001$) without increasing placement time. Significantly more CVCs were placed in the middle of the superior vena cava in group ECG ($P \leq 0.001$), although placement into the right atrium or right ventricle and into other vessels occurred significantly more often in group NO-ECG ($P \leq 0.001$). Twenty patients in group NO-ECG required repositioning of their CVC after surgery, whereas this maneuver was necessary only in three patients in group ECG ($P \leq 0.001$).

CONCLUSIONS: ECG guidance allows for more accurate CVC placement, and should be considered to increase patient safety and reduce costs associated with repositioning procedures.

(Anesth Analg 2007;104:65-70)

The intracavitary ECG method for positioning the tip of central venous catheters: results of an Italian multicenter study

Mauro Pittiruti¹, Daniele Bertollo², Ermanno Briglia³, Massimo Buononato⁴, Giuseppe Capozzoli⁵, Luigi De Simone⁶, Antonio La Greca¹, Cecilia Pelagatti⁷, Pier Sandro Sette⁸

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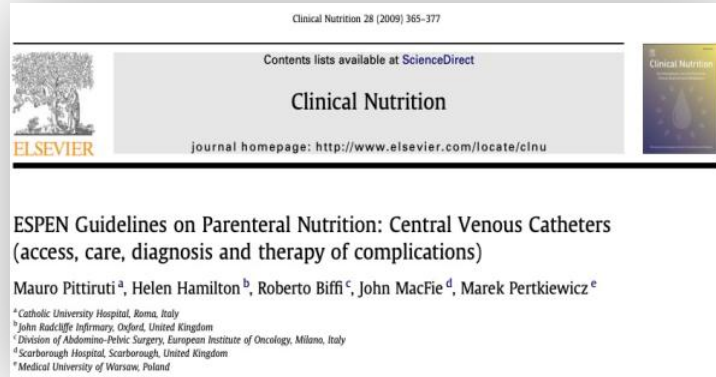
⁸Department of Anesthesia and Intensive Care, Ospedale Fracastoro, San Bonifacio - Italy

Intra-cavitary ECG is an effective method for correct positioning of the tip of tunneled Groshong catheters

Giuseppe Capozzoli, C' Scarica ccinelli, Loris Fabbro, Roberta Pedrazzoli, Franco Auricchio

Anesthesia and Intensive Care Unit, Bolzano Central Hospital - Italy

Tip location con ECG intracavitario



Comments: For any central venous access (short-, medium- or long-term), the position of the tip of the catheter plays a critical role. The ideal position has been said to be between the lower third of the superior cava vein and the upper third of the right atrium. In

Ideally, the position of the tip should be checked during the procedure,²⁷ either by fluoroscopy or by the ECG method.^{28,29} If the

Tip location con ECG intracavitario

L'ECG intracavitario (**IC-ECG**) è una metodica

- non invasiva
- sicura
- accurata
- costoefficace

per tip location intraprocedurale

The intracavitary ECG method for positioning the tip of central venous catheters: results of an Italian multicenter study

Mauro Pittiruti¹, Daniele Bertollo², Ermanno Briglia³, Massimo Buonomato⁴, Giuseppe Capozzoli⁵, Luigi De Simone⁶, Antonio La Greca¹, Cecilia Pelagatti⁷, Pier Sandro Sette⁸

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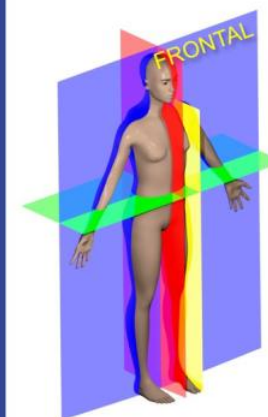
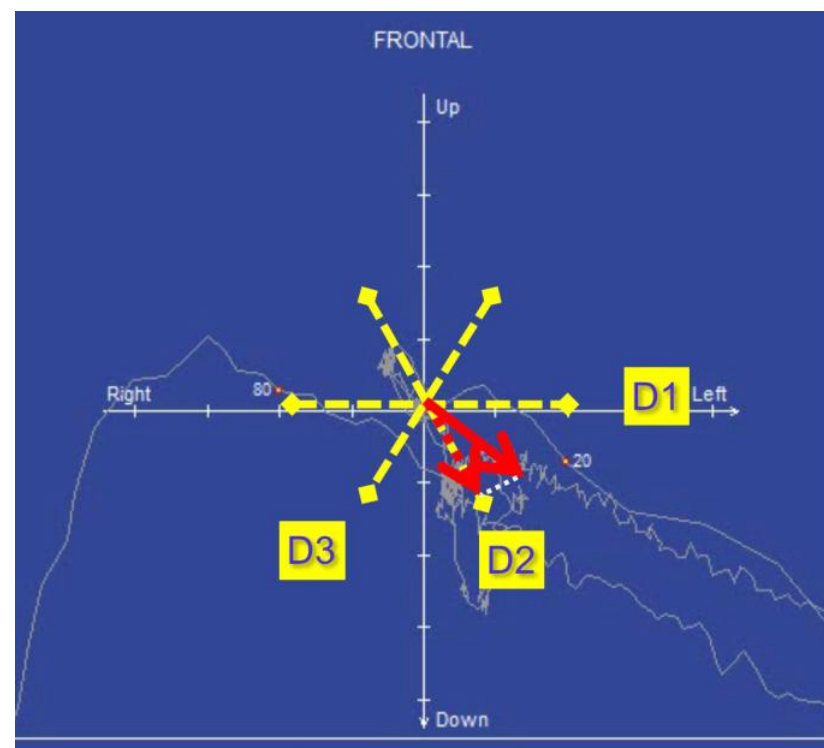
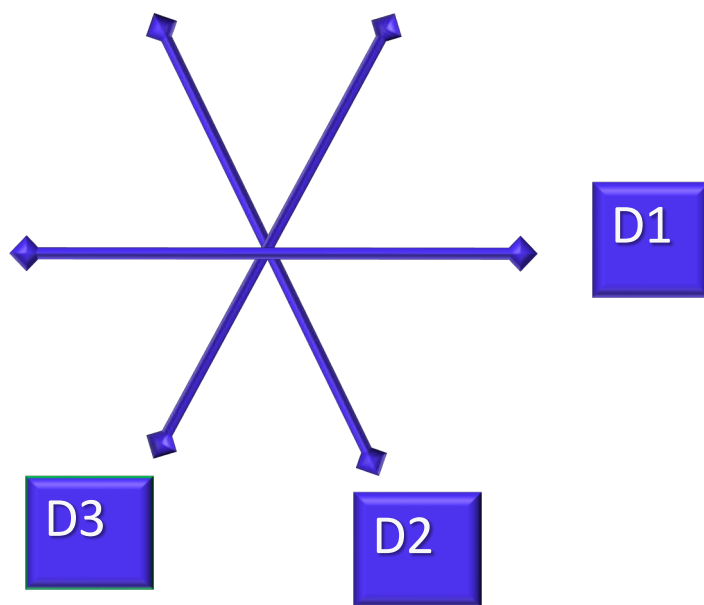
⁶Department of Anesthesia and Intensive Care, Az. Osp. Universitaria di Pisa, Pisa - Italy

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⁸Department of Anesthesia and Intensive Care, Ospedale Fracastoro, San Bonifacio - Italy

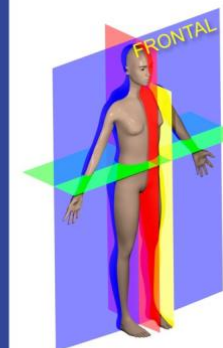
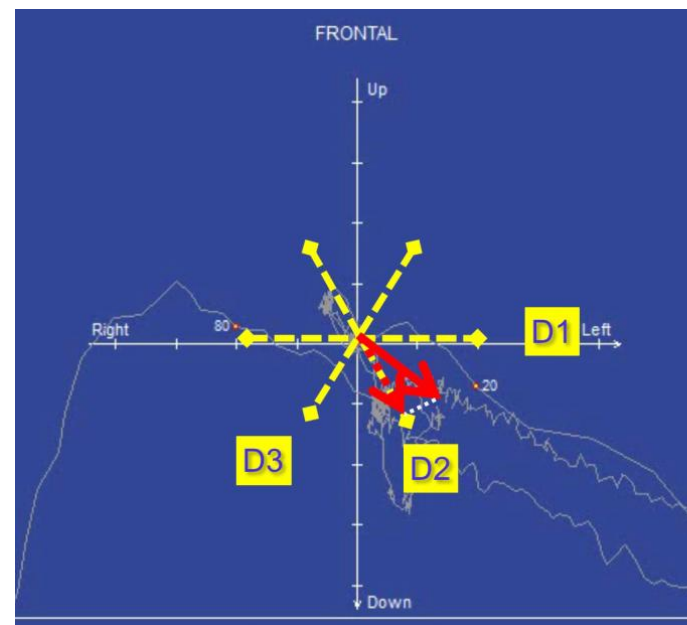
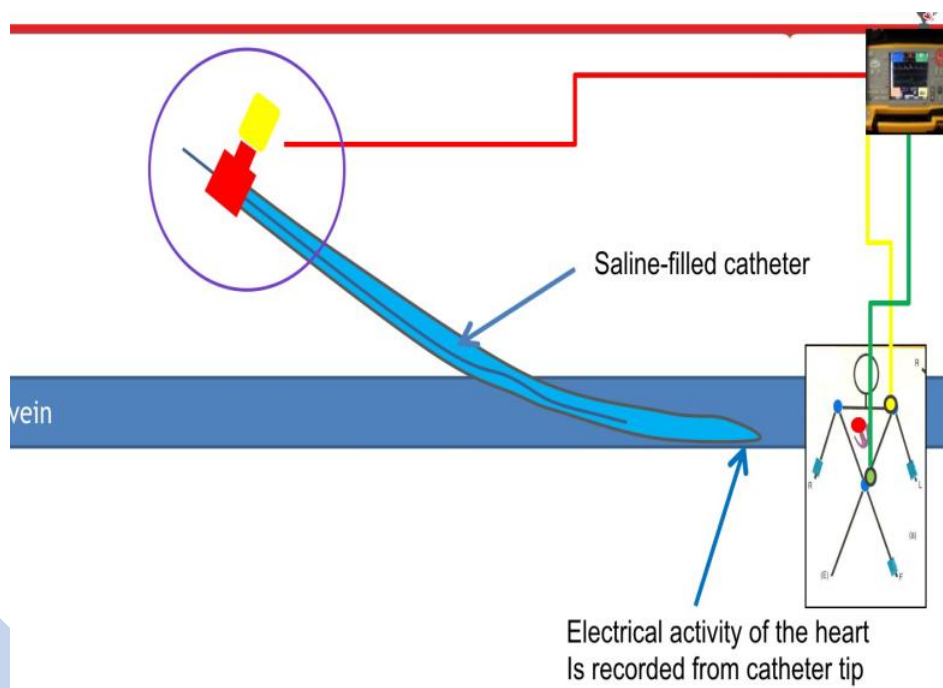
Conclusions: Our multicenter study confirms that the intracavitary ECG method for real time verification of tip position is accurate, safe, feasible in all adult patients and applicable to any type of short-term or long-term central venous access device.

ECG intracavitario: tecnica

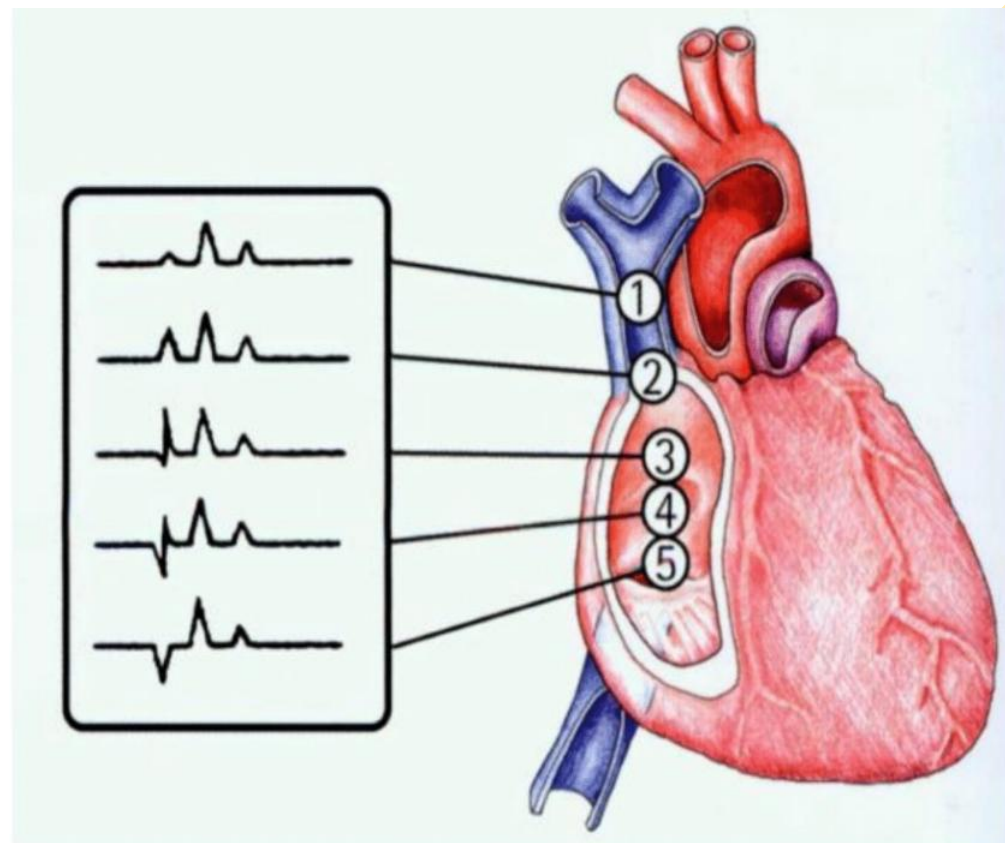
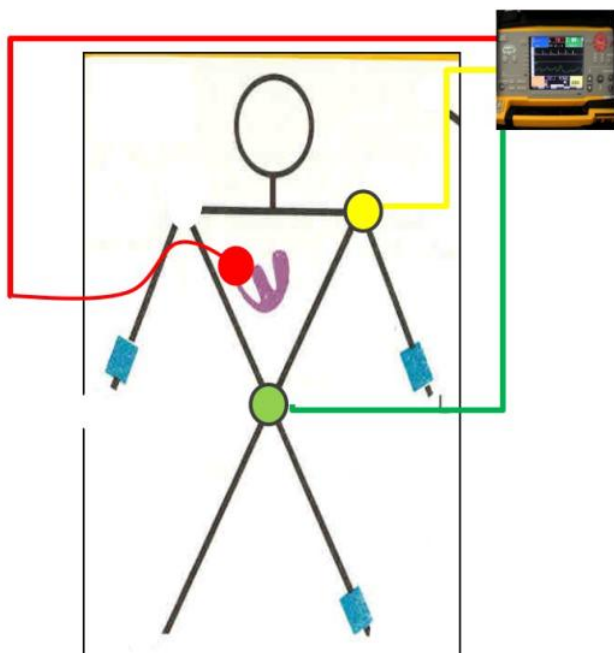


Modificato da Rowland D. Interpretazione
dell'elettrocardiogramma

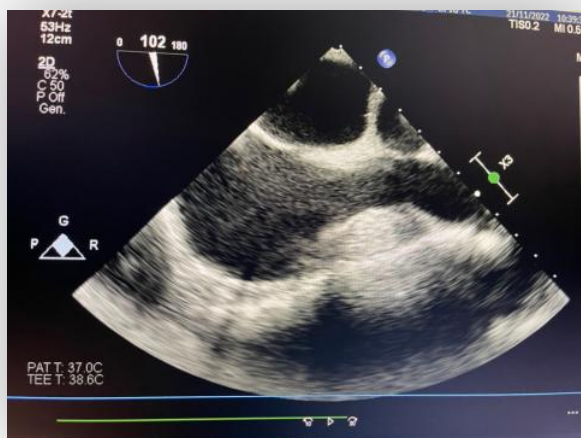
ECG intracavitario tecnica



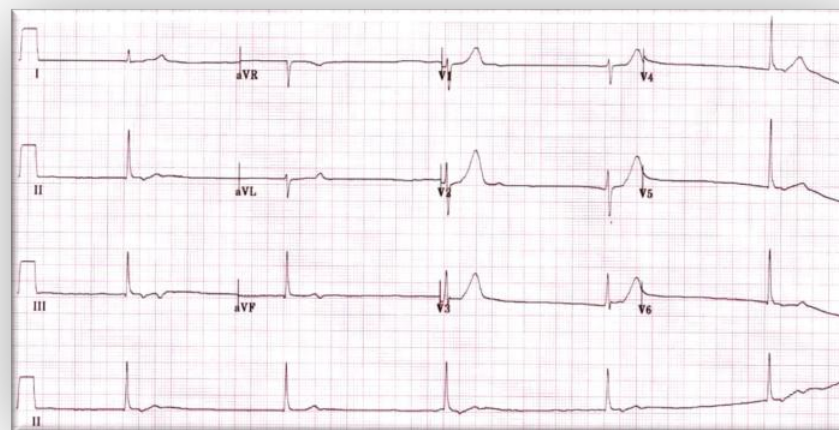
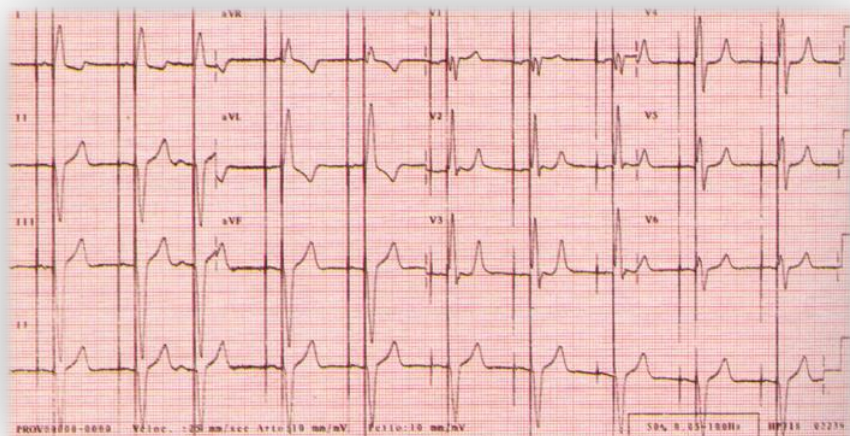
ECG intracavitario: tecnica



ECG intracavitario convenzionale

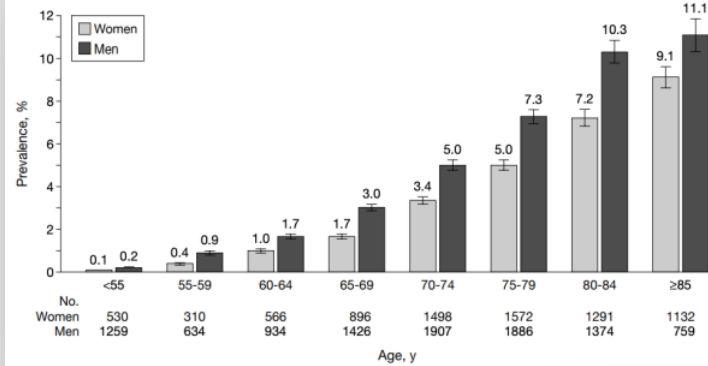


ECG intracavitario: limiti

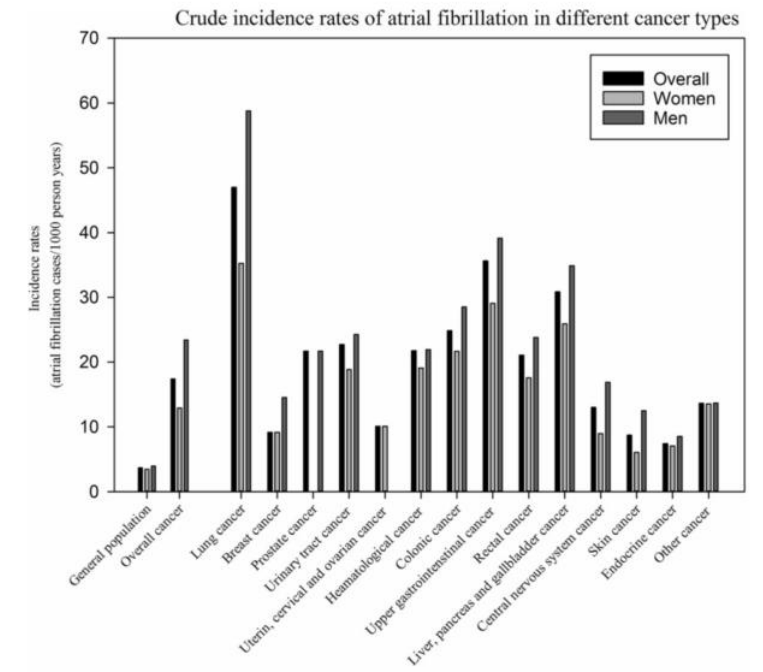
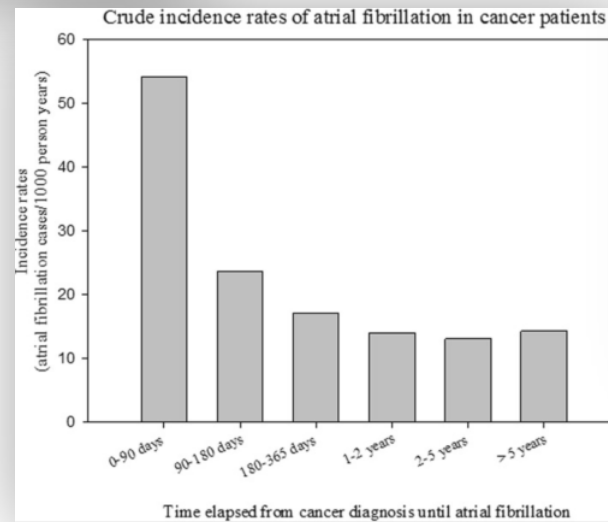


ECG intracavitario e fibrillazione atriale

Figure 2. Prevalence of Diagnosed Atrial Fibrillation Stratified by Age and Sex



Errors bars represent 95% confidence intervals. Numbers represent the number of men and women with atrial fibrillation in each age category.



ECG intracavitario modificato



Original research article

A modified intracavitary electrocardiographic method for detecting the location of the tip of central venous catheters in atrial fibrillation patients

Maria Calabrese¹, Luca Montini², Gabriella Arlotta¹, Antonio La Greca³, Daniele G Biasucci², Francesca Bevilacqua¹, Enrica Antoniucci¹, Andrea Scapigliati¹, Franco Cavaliere¹ and Mauro Pittiruti³

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ECG intracavitario modificato

Table 1. ANOVA of the *f*-wave measurements according to the different methods.

Methods to measure the <i>f</i> wave	Anatomical site	Mean $\pm$ SD (no. of observations)	Pairwise comparison ^a
Method A	SVC	1.9 $\pm$ 0.89 (385)	SVC vs CAJ
	CAJ	3.33 $\pm$ 1.47 (590)	CAJ vs RA; CAJ vs SVC
	RA	2.08 $\pm$ 0.75 (376)	RA vs CAJ
Method B	SVC	2.11 $\pm$ 1.32 (180)	SVC vs CAJ
	CAJ	4.52 $\pm$ 1.87 (180)	CAJ vs RA; CAJ vs SVC
	RA	2.03 $\pm$ 0.9 (180)	RA vs CAJ
Method C	SVC	2.34 $\pm$ 1.39 (180)	SVC vs CAJ
	CAJ	5.07 $\pm$ 2.07 (180)	CAJ vs RA; CAJ vs SVC
	RA	2.32 $\pm$ 0.93 (180)	RA vs CAJ

ANOVA: analysis of variance; SVC: superior vena cava; RA: right atrium; CAJ: cavo-atrial junction; SD: standard deviation.

^aANOVA was significantly different for all ($p < 0.001$); each pairwise comparison was individually significant ($p < 0.05$) at post hoc analysis (Scheffé's test for all pairwise comparisons).

ECG intracavitario modificato



L'IC-ECG è sicuro, riproducibile, accurato nell'identificare la posizione della punta dei cateteri venosi centrali nei pazienti con la fibrillazione atriale e può sostituire altre metodiche di tip location come la fluoroscopia o il controllo radiografico post procedurale in quanto meno accurate, meno sicure e più costose.



New Ideas

**TIP LOCATION CON IL METODO ELETTROCARDIOGRAFICO INTRACAVITARIO
NELLA CANNULAZIONE PERCUTANEA DELLA VENA CAVA SUPERIORE**

Gemelli



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AUTORE: dr M. Calabrese

M. Calabrese

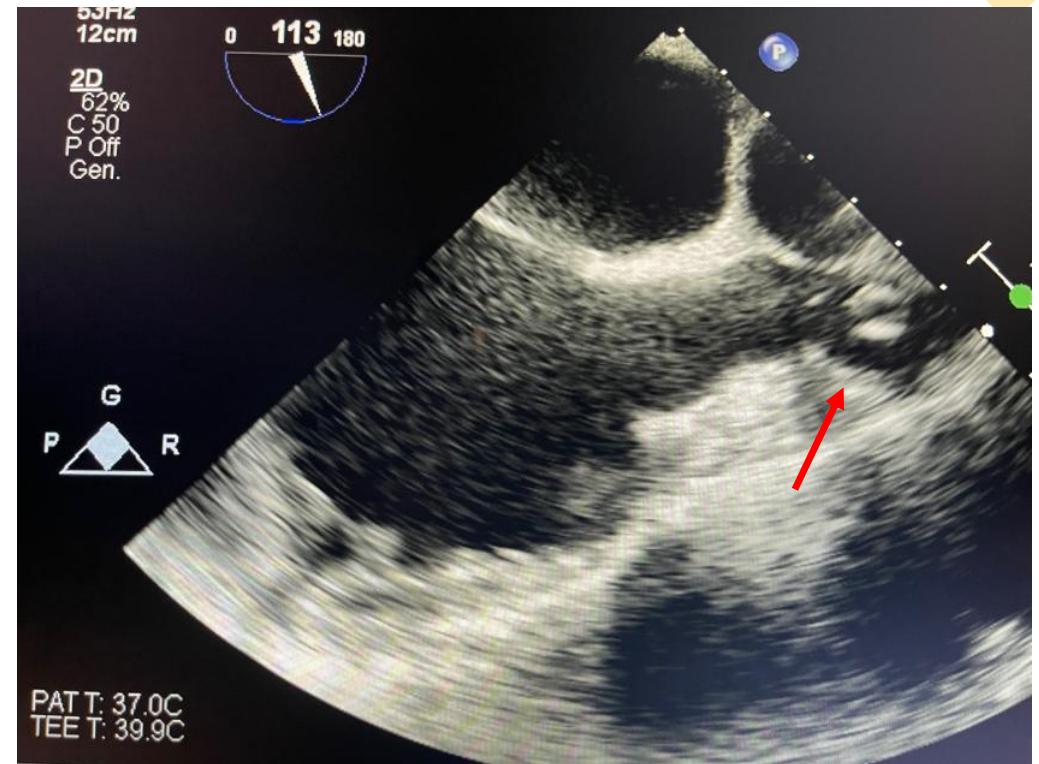
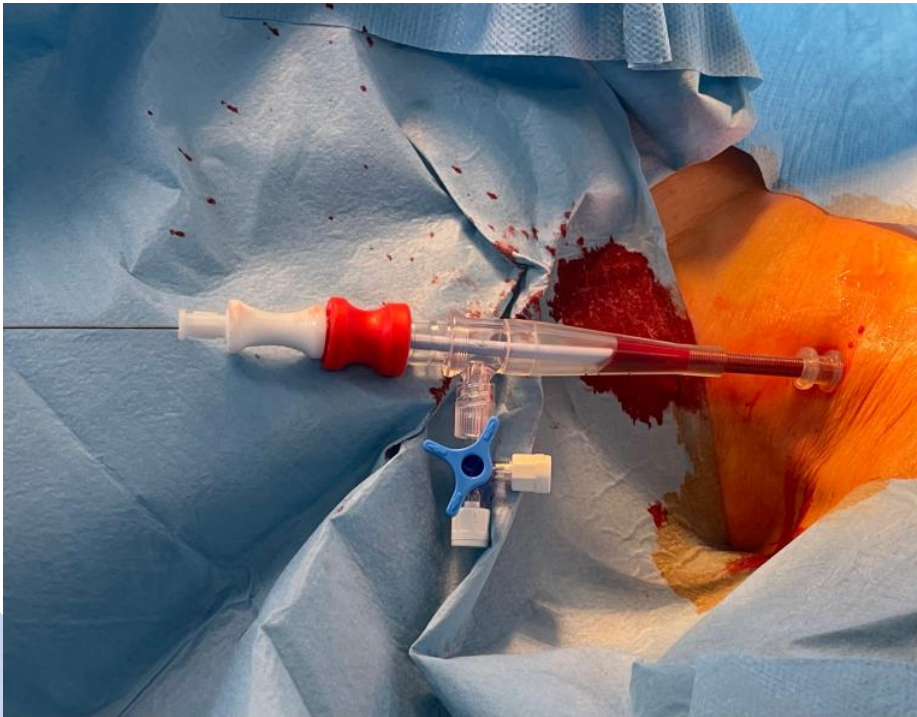


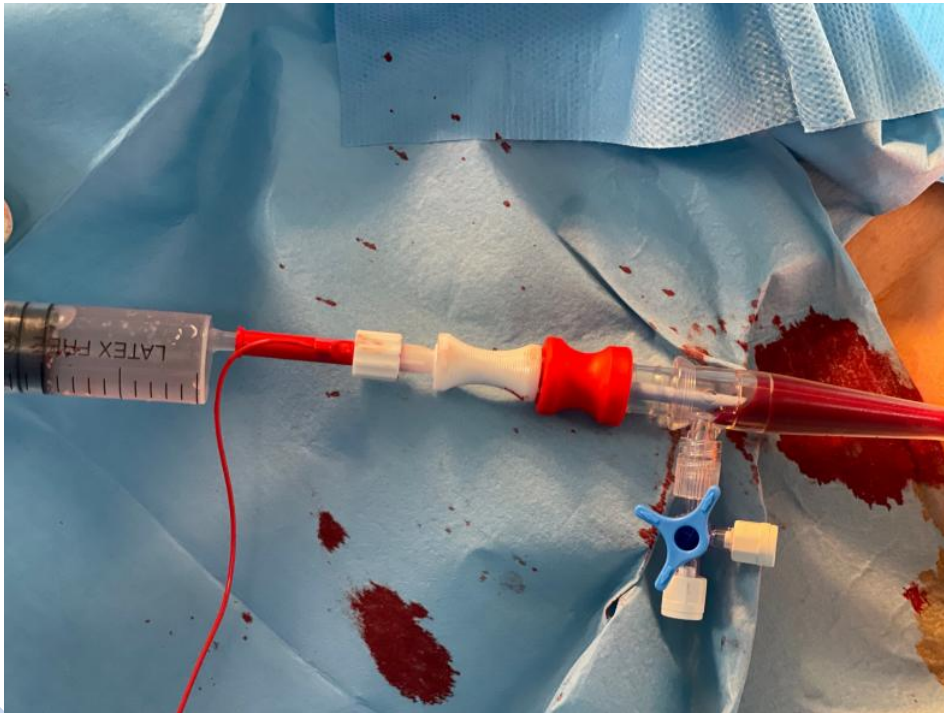
Delibera Comitato Etico ID 4193



Edwards Cardiac Cannulae OptiSite

Cannulazione percutanea della Vena Cava Superiore





Caratteristiche cliniche dei pazienti arruolati

Table 1. Caratteristiche cliniche dei pazienti

Paziente	Età (anni)	Altezza(cm)	Superficie Corporea (m ²)	BMI (Kg/m ²)	NYHA	EU II, %	Intervento chirurgico
1	74	165	1,7	27,55	3	1,95	Valvuloplastica mitralica e tricuspidalica sec De Vega, CABG
2	43	187	2,3	26,3	3	0,96	Valvuloplastica mitralica e tricuspidalica sec De Vega,
3	72	175	1,8	24,5	2	0,8	Valvuloplastica mitralica e tricuspidalica
4	78	160	1,3	22,7	3	1,51	SVM e valvuloplastica tricuspidalica sec de Vega
5	77	185	2,1	27,3	3	1,24	Valvuloplastica mitralica e tricuspidalica
6	34	106	2,19	39,9	3	1,3	Valvuloplastica tricuspidale, resezione membrana subaortica
7	43	177	1,9	24,9	3	0,96	Valvuloplastica mitralica e tricuspidalica
8	67	180	2	25	2	0,99	Valvuloplastica mitralica e tricuspidalica
9	57	175	1,9	26,4	2	0,77	Valvuloplastica mitralica e tricuspidalica
10	56	190	32,8	2,29	3	0,67	SVM, valvuloplastica tricuspidalica
11	84	167	1,5	23,3	3	1,34	Valvuloplastica mitralica e tricuspidalica
12	72	170	1,8	28,7	3	0,7	SVM, plastica della tricuspidale secondo De Vega
13	75	176	1,8	24,9	3	1,73	SVM, plastica della tricuspidale secondo De Vega
14	68	173	1,75	25,2	3	0,67	Valvuloplastica mitralica e tricuspidalica
15	55	180	2	24,7	3	1,16	Valvuloplastica mitralica, aortica e tricuspidalica sec De Kay
16	38	165	1,3	21,3	2	0,83	Asportazione massa atriale
17	59	170	1,8	27,7	2	0,69	Valvuloplastica mitralica e tricuspidalica sec De Vega

Legenda. BMI =body mass index; NYHA = New York Heart Association; EU II = Euroscore II; SC = superficie corporea (formula di Mosteller); SVM= sostituzione valvolare mitralica

Risultati

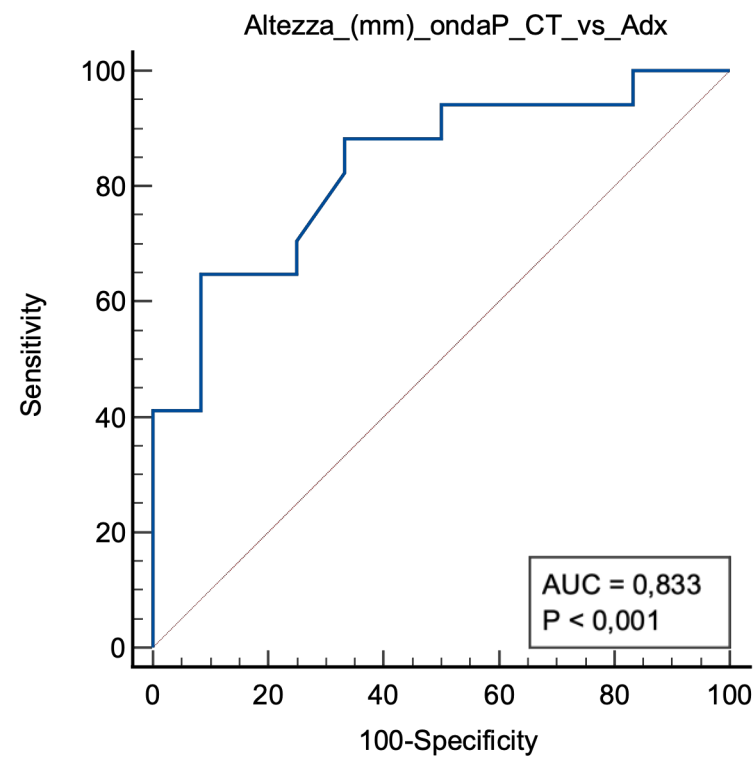
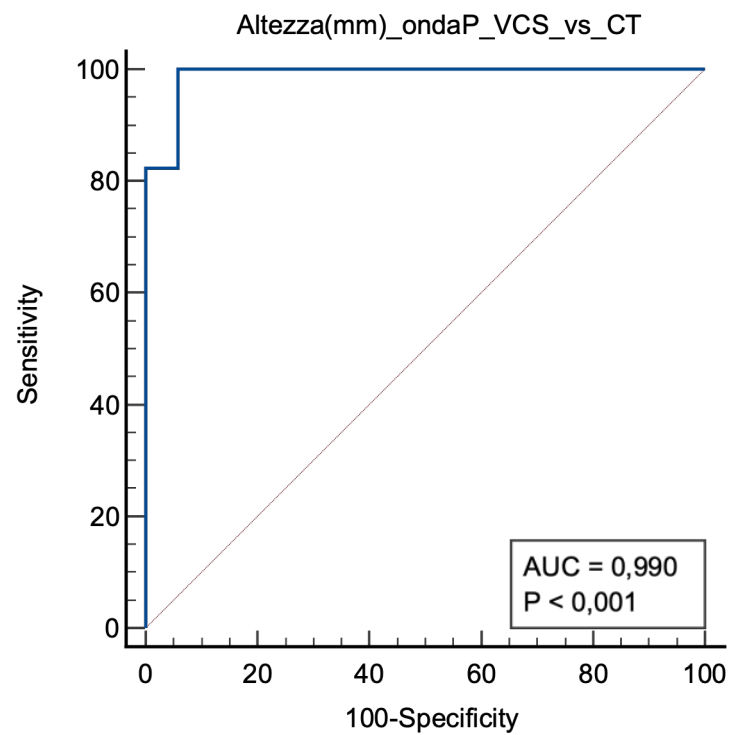
Table 2.

Paziente	VCS	Crista Terminalis	Atrio
1	2,5	6,15	3,25
2	4	8,4	6,7
3	1,5	6,2	6
4	2	6,25	4
5	4	7,55	6,85
6	3,5	7,8	3,8
7	2	7,9	6,05
8	2,5	11,4	7,75
9	2,5	7	5,3
10	1,5	6,2	3,85
11	4	9,3	5,2
12	2	5,78	3,5
13	2,1	7,1	4,6
14	2,8	7	5,2
15	2,9	8,1	5,3
16	1,9	3,7	3,8
17	3,6	10	6,2

Valori mediani e medi dell'altezza dell'onda P misurata nelle tre posizioni anatomiche del gruppo di

	Vena cava superiore (mm)	Crista terminalis (mm)	Atrio destro (mm)
Minimo	1,5	3,7	3,2
25 th percentile	2	6,2	3,8
Mediana	2,5	7,1	5,3
75 th percentile	3,5	8,2	6,5
Massimo	4	11,4	7,7
Media	2,6	7,4	5,2
Standard deviation	0,86	1,7	1,5
Standard Error	0,21	0,43	0,44

Risultati



Conclusioni

L' ECG intracavitario è una metodica fattibile ed accurata nell'identificare la posizione della punta delle cannule da circolazione extracorporea posizionate per via percutanea attraverso la vena giugulare interna destra in vena cava superiore

Conclusioni

Il vantaggio della metodica applicata a questo tipo di cannula è:
la possibilità di effettuare **tip location intraprocedurale** in quei casi in cui l'ecocardiogramma transesofageo non è fattibile perchè in **setting differente da quello cardiocirurgico** e perché il TEE non consente la visualizzazione della porzione di vena cava superiore più distante dalla giunzione cavo-atriale.



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Grazie dell'attenzione

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